Coastal Management Glossary

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Introduction

This glossary provides definitions of terms that are in common use when describing coastal processes and coastal management. It is not a comprehensive dictionary of coastal terminology. It supplements definitions provided in the *Coastal Management Act 2016* (CM Act) and State Environment Planning Policy (Coastal Management) 2018 (CM SEPP).

The definitions used in the glossary are sourced from the US Army Corps of Engineers and from glossaries provided in relevant Standards, as well as from other coastal management guidelines in current use in Australia.

Glossary

Acceptable risk – a risk that, following an understanding of the likelihood and consequences, is sufficiently low to require no new treatments or actions to reduce risk further. Individuals and society can live with this risk without feeling the necessity to reduce risks further. Positive and negative risks are negligible or so small that no risk treatments are needed.

Accretion – as the build-up of sediments to form land or shoaling in coastal waters or waterways. It may be either natural or artificial. Natural accretion is the build-up of land on the beach, dunes, or in the water by natural processes, such as waves, current and wind. Artificial accretion is a similar build-up of land resulting from built structures such as groynes or breakwaters, or activities such as filling and beach nourishment, or also aggradation. (USACE)

Adaptation – adjustment in natural or human systems in response to actual or expected climate change or its effect, to moderate harm or to take advantage of beneficial opportunities.

Adaptive capacity – the ability of a system (human or natural) to adjust to hazards or threats (including variability and extremes) to moderate potential dangers, to take advantage of opportunities or to cope with the consequences.

Alongshore or Longshore – parallel to and near the shoreline.

Ambulatory – in relation to the coastal foreshore, this means the movement of the foreshore seaward or landward over time, in response to coastal processes and sediment budgets. The movement of the foreshore may occur at different rates or in different directions along a beach or within a sediment compartment.

Annual Exceedance Probability (AEP) – the probability (expressed as a percentage) of an exceedance (e.g. large wave height or high water level) in a given year.

Aquatic habitat – typical submerged communities extending from near sea, river, or lake level down several feet, such as tidal flats, oyster beds, clam flats, seagrass beds, or fishing reefs.

Artificial nourishment – see ‘beach nourishment’

Asset – something of value and may be environmental, economic, social, recreational or a piece of built infrastructure.

Audit – independent appraisal of social, financial and environmental performance.

Average Recurrence Interval (ARI) – the average time between which a threshold is reached or exceeded (e.g. large wave height or high water level) of a given value. Also known as Return Period.

Back barrier – pertaining to the lagoon–marsh–tidal creek complex in the lee of a coastal barrier island, barrier spit, or bay-mouth barrier.

Back beach or back shore – the zone of the shore or beach lying between the foreshore and the coastline comprising the berm or berms and acted upon by waves only during severe storms, especially when combined with exceptionally high water.

Bathymetric data – measurements of the shape of the bed or the depth of a body of water.

Beach – the CM Act defines beach as an area that is generally composed of sand or pebbles or similar sediment that extends landward from the lowest astronomical tide to the line of vegetation or bedrock or structure.

Beach erosion – refers to landward movement of the shoreline and/or a reduction in beach volume, usually associated with storm events or a series of events, which occurs within the beach fluctuation zone. Beach erosion occurs due to one or more process drivers; wind, waves, tides, currents, ocean water level, and downslope movement of material due to gravity.

Beach fluctuation zone – CM Act defines beach fluctuation zone as 'the range of natural locations a beach profile occupies from its fully accreted condition to its fully eroded condition, with

a) a landward limit defined by the escarpment resulting from the erosion associated with a 1% storm event or a more extreme event of record, whichever is the greater landward limit, and

b) a seaward limit that is the 40m depth seaward of the highest astronomical tide for the open coast and 10m depth seaward of the highest astronomical tide for estuaries or tidal coastal lakes.'

Beach material – granular sediments, usually sand or shingle moved by the sea.

Beach nourishment – beach restoration or augmentation using clean dredged or fill sand. Dredged sand is usually hydraulically pumped and placed directly onto an eroded beach or placed in the littoral transport system. When the sand is dredged in combination with constructing, improving, or maintaining a navigation project, beach nourishment is a form of beneficial use of dredged material.

Beach plan shape – the shape of the beach in plan; usually shown as a contour line, combination of contour lines or recognisable features such as beach crest and/or the still water line.

Beach profile – a cross-section taken perpendicular to a given beach contour; the profile may include the face of a dune or seawall, extend over the backshore, across the foreshore, and seaward underwater into the nearshore zone.

Beach ridge – a nearly continuous mound or ridge of beach material (including sand, shell, coral and gravel) that has been shaped by wave or other action. Beach ridges may occur singly or as a series of approximately parallel deposits. A beach ridge plain is composed of a series of parallel beach ridges. The ridges may be of different heights and spacing. They provide evidence of changes to deposition and erosion rates over time.

Beach scraping – also referred to as 'nature assisted beach enhancement' (NABE) is a mechanical intervention to speed up the natural processes of berm and foredune recovery after a storm event.

Beach system – the CM Act defines as 'the processes that produce the beach fluctuation zone and the incipient foredunes and foredunes landward of the relevant beach'. In general,

this means coastal lands, composed of sand, gravel or shell, between a seaward limit of 40 metres depth in the State coastal waters and a landward limit at the lee side of the dunes.

Bedrock – a general term for the rock, usually solid, that underlies soil or other unconsolidated, superficial material.

Beneficial uses – placement or use of dredged material for some productive purpose. May involve either the use of the dredged material or the placement site as the integral component of the use.

Benthic – of, pertaining to, or related to, the bottom of a stream or other body of water.

Berm – on a beach, a nearly horizontal plateau on the beach face or backshore, formed by the deposition of beach material by wave action or by means of a mechanical plant as part of a beach renourishment scheme. Some natural beaches have no berm, others have several.

Biodiversity – see 'biological diversity'.

Biological diversity – the richness and variety of life (plant and animal) and habitats. It includes genetic diversity, species diversity and the variety of communities or ecosystems.

Black water – water with little or no oxygen in it. It may develop on coastal floodplains after a summer flood event. The dark colour is due to the breakdown of plants and other organic matter. It has high dissolved organic carbon from the rotting vegetation. It develops higher iron levels the longer it pools on the land. It also often has a very unpleasant smell.

Blow out – depression on the land surface (usually a dune) caused by wind erosion.

Bluff – a high, steep bank or cliff.

Brackish – slightly salty water.

Breaker zone – the zone within which waves approaching the coastline commence breaking, typically in water depths of between five and 10 metres for ocean coasts, but sometimes in shallower water.

Breakwater – a man-made structure protecting a shore area, harbour, anchorage or basin from waves.

Bruun Rule – a commonly used method for estimating the response of a sandy shoreline to rising sea levels.

Buffer area – parcel or strip of land that is designed and designated to permanently remain vegetated in an undisturbed and natural condition to protect an adjacent aquatic or wetland site from upland impacts, to provide habitat for wildlife and to afford limited public access.

Bypassing, sand – hydraulic or mechanical movement of sand from the accreting up–drift side to the eroding down-drift side of an inlet or harbour entrance. The hydraulic movement may include natural movement as well as movement caused by humans.

Catchment area – the area which drains naturally to a particular point on a river, thus contributing to its natural discharge.

Cliff – a high, steep face of rock; a precipice.

Climate – the characteristic weather of a region, particularly regarding temperature and precipitation, averaged over some significant interval of time (years).

Climate change – occurs naturally in response to long-term variables, but often used to describe a change of climate that is directly attributable to human activity that alters the global atmosphere, increasing change beyond natural variability and trends.

Closure depth – do not detect vertical seabed changes, generally considered the seaward limit of littoral transport (collected over several years). The depth can be determined from

repeated cross-shore profile surveys or estimated using formulas based on wave statistics. Note that this does not imply the lack of sediment motion beyond this depth.

Coast – a strip of land of variable width that extends from the shoreline inland to the first significant landform that is not influenced by coastal processes (such as waves, tides and associated currents).

Coastal asset – includes natural features of the coastal zone, including landforms, ecosystems and species; and built assets such as infrastructure, public and private buildings or structures.

Coastal dune – vegetated and unvegetated sand ridges built-up at the back of a beach. They comprise dry beach sand that has been blown landward and trapped by plants or other obstructions. Stable sand dunes act as a buffer against wave damage during storms, protecting the land behind from salt water intrusion, sea spray and strong winds. Coastal dunes also act as a reservoir of sand to replenish and maintain the beach at times of erosion.

Coastal engineering – a branch of civil engineering that applies engineering principles specifically to projects within the coastal zone (nearshore, estuary, marine, and shoreline).

Coastal environment – the landscape, functions and communities in the coastal zone.

Coastal environment area – land identified in the CM Act as land containing coastal features such as coastal waters of the State, estuaries, coastal lakes, coastal lagoons and land adjoining those features, including headlands and rock platforms. The CM SEPP maps the extent of the coastal environment area for planning purposes.

Coastal flooding – flooding of low lying areas by ocean waters, caused by a higher than normal sea level.

Coastal forcing – the natural processes which drive coastal hydro and morpho-dynamics (e.g. winds, waves, tides, etc.).

Coastal hazard – defined in the CM Act to mean the following:

- beach erosion
- shoreline recession
- coastal lake or watercourse entrance instability
- coastal inundation
- coastal cliff or slope instability
- tidal inundation
- erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters.

Coastal inundation – coastal inundation occurs when a combination of marine and atmospheric processes raises the water level at the coast above normal elevations, causing land that is usually ‘dry’ to become inundated by sea water. Alternatively, the elevated water level may result in wave run-up and overtopping of natural or built shoreline structures (e.g. dunes, seawalls).

Coastal lake or lagoon – a coastal water body that is generally closed off from the sea by a sandy barrier. Water levels and water quality may be quite different to the nearby ocean.

Coastal lake or watercourse entrance instability – refers to the variety of potential hazards and risks associated with the dynamic nature of both natural and trained entrances. Coastal lake and watercourse entrances are highly active environments with their shape constantly changing in response to processes such as alongshore sediment transport, tidal flows, storms and catchment flooding.

Coastal Management Area – any one of four areas that make up the coastal zone as defined in the CM Act. These are the coastal wetlands and littoral rainforests area, coastal vulnerability area, coastal environment area, and the coastal use area.

Coastal management objectives – specific objectives identified in the CM Act for each of the four coastal management areas.

Coastal management program – a long-term strategy for the coordinated management of land within the coastal zone, prepared and adopted under Part 3 of the CM Act.

Coastal management units – may be identified for the purposes of coastal management at a local or community level. They are sections of the coast that are affected by similar coastal hazards and risks or have several important social and economic features in common.

Coastal model – model of a coastal area. Often a movable bed model used to reproduce coastal sediment transport; or a model of estuary circulation.

Coastal processes – marine, physical, meteorological and biological activities that interact with the geology and sediments to produce a particular coastal system.

Coastal protection works – the CM Act defines coastal protection works as:

a) beach nourishment

b) activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters, including (but not limited to) seawalls, revetments and groynes.

Coastal risk – a risk that relates to the likelihood and consequences of coastal hazards or threats affecting coastal values.

Coastal sediment compartment – an area of the coast defined by its sediment flows and landforms. Coastal sediment compartments may be mapped at primary, secondary or tertiary (local) scales. Boundaries are generally defined by structural features related to the geologic frameworks that define the planform of the coast.

Coastal threat – a process or activity that is putting pressure on or impacting on the health or function of a coastal ecosystem, or on the amenity and social or cultural value of the coastal landscape. Examples include the discharge of effluent or poor-quality stormwater into coastal lakes and lagoons, discharges from acid sulfate soils, or the spread of invasive species. High recreational demand can also be a threat to coastal ecosystem health.

Coastal use area – land identified by the CM Act and CM SEPP as being land adjacent to coastal waters, estuaries, coastal lakes and lagoons where development is or may be carried out (now or in the future). The CM SEPP maps the extent of the coastal use area for planning purposes.

Coastal vulnerability area – defined in the CM Act as land subject to seven coastal hazards.

Coastal wetland – wetlands are areas that are inundated cyclically, intermittently or permanently with fresh, brackish or saline water and have soils, plants and animals in them that are adapted to, and depend on, moist conditions for at least part of their lifecycle. Coastal wetlands include marshes, mangroves, swamps, melaleuca forests, casuarina forests, sedgelands, brackish and freshwater swamps and wet meadows.

Coastal zone – as defined in the CM Act and CM SEPP: the area of land comprised of the following coastal management areas: the coastal wetlands and littoral rainforest area, the coastal vulnerability area, the coastal environment area and the coastal use area.

Coastal zone (general) – the transition zone where the land meets water, the region that is directly influenced by marine and lacustrine hydrodynamic processes. Extends offshore to the continental shelf break and onshore to the first major change in topography above the

reach of major storm waves. On barrier coasts, includes the bays and lagoons between the barrier and the mainland.

Coastal zone management – the integrated management of issues affecting the coastal zone. Coastal zone management is not restricted to coastal protection works, but includes also development and activities to manage the economical, ecological, cultural and social values of the coast.

Coastal zone management plan – a management plan for the open coast, an estuary or a coastal lake, prepared under the *Coastal Protection Act 1979*.

Community objectives – local scale objectives for management of the coast, based on the aspirations and priorities of local communities. When included in a coastal management program, these objectives will be based on, and must align with, the objectives expressed in a council's Community Strategic Plan.

Conceptual model – a simplified representation of the physical hydro-geologic setting. This includes the identification and description of the geologic and hydrologic framework, media type, hydraulic properties, and sources and sinks of flow.

Consequence – the outcome or impact of a hazard or threat.

Cost analysis – evaluation of the specific cost elements of a contract or proposal to appraise their statutory compliance, distribution, and reasonableness.

Cross-shore transport – refers to the sediment moved in a cross-shore direction to the coastline induced by water motions due to waves and currents.

Current, coastal – one of the offshore currents flowing generally parallel to the shoreline in the deeper water beyond and near the surf zone; these are not related genetically to waves and resulting surf, but may be related to tides, winds, or distribution of mass.

Current, littoral – any current in the littoral zone caused primarily by wave action; e.g. longshore current, rip current.

Current, longshore – the littoral current in the breaker zone moving essentially parallel to the shore, usually generated by waves breaking at an angle to the shoreline.

Cusp (or beach cusp) – one of a series of short ridges on the foreshore separated by crescent-shaped troughs spaced at more or less regular intervals. Between these cusps are hollows. The cusps are spaced at somewhat uniform distances along beaches. They represent a combination of constructive and destructive processes.

Deflation – the sorting out, lifting, and removal of loose dry fine-grained particles (clay and silt sizes) by the turbulent eddy action of the wind, as along a sand-dune coast or in a desert; a form of wind erosion.

Design storm – a hypothetical extreme storm with waves that coastal protection structures will often be designed to withstand. The severity of the storm (i.e. return period) is chosen in view of the acceptable level of risk of damage or failure. A design storm consists of a design wave condition, a design water level and a duration.

Design wave – in the design of harbour works, coastal protection works etc., the type or types of waves selected as having the characteristics against which protection is desired.

Diffraction of water waves – the phenomenon by which energy is transmitted laterally along a wave crest. When a part of a train of waves is interrupted by a barrier, such as a breakwater, the effect of diffraction is manifested by propagation of waves into the sheltered region within the barrier's geometric shadow.

Drowned river valley – a type of wave-dominated estuary, usually a deep bedrock embayment, with a wide, deep mouth.

Dune – underwater: flow-transverse bedform with spacing from under one metre to over 1000 metres that develops on a sediment bed under unidirectional currents.

Dune – subaerial (see coastal dune).

East Coast Low – an intense low-pressure system that occurs off the east coast of Australia, bringing storms, high waves and heavy rain. East coast lows generally occur in autumn and winter off NSW, southern Queensland and eastern Victoria.

Economic evaluation – an assessment that helps decision-makers to understand the socioeconomic implications of adopting alternative management options and to make choices that will provide net benefits to the community. Cost-benefit analysis is a type of economic evaluation that considers and evaluates a wide range of costs and benefits associated with a proposal, in qualitative or quantitative (monetary) terms (with future costs and benefits reduced to today's prices), compared with a base case. It may be used in conjunction with other criteria (such as technical feasibility, community acceptance or environmental impact) to select optimal management responses. A multi-criteria assessment is not an economic evaluation but may assist decision-making in other ways.

Ecosystem – the living organisms and the non-living environment interacting in an area, encompassing the relationships between biological, geochemical, and geophysical systems; or a community and its environment including living and non-living components.

Ecosystem integrity – the intactness, completeness and extent of natural function of an ecosystem.

Ecosystem resilience – see resilience.

El Niño southern oscillation (ENSO) – a year to year fluctuation in atmospheric pressure, ocean temperatures and rainfall associated with El Niño (warming of the oceans in the equatorial eastern and central Pacific). El Niño tends to bring below average rainfall.

Endangered Ecological Community (EEC) – an ecological community listed in the *Biodiversity Conservation Act 2016* as endangered. Examples include coastal saltmarsh, littoral rainforest and Themeda grasslands on headlands.

Environment – surroundings, the physical and biological system supporting life, including humans and their built environment. Includes cultural features of archaeological or historical interest.

Eolian or Aeolian processes – pertaining to the wind, especially used with deposits such as loess and dune sand, and sedimentary structures like wind-formed ripple marks.

Erosion – the wearing away of land by the action of natural forces. On a beach, the carrying away of beach material by wave action, tidal currents, littoral currents, or by deflation.

Escarpment (storm bite) – the landward limit of erosion in the dune system caused by storm waves. At the end of a storm the escarpment may be nearly vertical; as it dries out the sand slumps to a typical slope of one vertical to 1.5 horizontal.

Essential infrastructure – CM Act defines to include infrastructure for the following purposes: electricity generation, transmission and distribution, telecommunications, rail, roads, gas, sewerage systems, water supply systems or stormwater management systems, airports, ports shipping and harbours.

Essential services – those services that are considered essential to the life of communities and include energy, transport, health services, sanitation services, water and welfare institutions (*State Flood Plan and Essential Services Act 1988*).

Essential utilities – those services that are considered essential to public safety and organised communities. Such services include electricity, gas, water, sewerage, sanitation, telecommunications and waste collection (*State Flood Plan and Essential Services Act 1988*).

Estuary – CM Act defines as any part of a river, lake, lagoon, or coastal creek whose level is periodically or intermittently affected by coastal tides, up to the highest astronomical tide.

Estuary inundation – flooding around the shoreline of an estuary or coastal lake, by a mixture of tidal water and catchment flood water.

Eutrophication – the process by which a body of water i.e. river or stream, becomes richer and richer in plant nutrients until, eventually, plants overgrow and their decomposing remains cause the deoxygenation of the water, which becomes foul-smelling and virtually lifeless.

Exposure – the potential for assets to be impacted by a hazard based on data or modelling of the hazard.

Extreme storm event – storm for which characteristics (wave height, period, water level etc.) were derived by statistical 'extreme value' analysis. Typically, these are storms with average recurrence intervals (ARI) ranging from one to 100 years.

Fit for purpose – right for the job it is intended to do. A fit for purpose assessment considers the level of data detail and the types of consultation required to make a reasonable management decision. In general, the detail and consultation required will increase with risk, complexity and impact.

Flood – period when tide level is rising; often taken to mean the flood current which occurs during this period; or a flow beyond the carrying capacity of a channel.

Floodplain – a flat tract of land bordering a river, mainly in its lower reaches, and consisting of alluvium deposited by the river. It is formed by the sweeping of the meander belts downstream, thus widening the valley, the sides of which may become some kilometres apart. In time of flood, when the river overflows its banks, sediment is deposited along the valley banks and plains. Usually synonymous with 100-year floodplain. The land area susceptible to being inundated by stream derived waters with a 1% chance of being equalled or exceeded in any given year.

Flushing time – the time required to replace all the water in an estuary, harbour, etc., by action of current and tide.

Foredune – the larger and more mature dune lying between the incipient dune and the hind-dune area. Foredune vegetation is characterised by grasses and shrubs. Foredunes provide an essential reserve of sand to meet the erosion demand during storm conditions. During storm events, the foredune can be eroded back to produce a pronounced dune scarp.

Foreshore – the part of the shore, lying between the crest of the seaward berm (or upper limit of wave wash at high tide) and the ordinary low water mark, that is ordinarily traversed by the uprush and backrush of the waves as the tides rise and fall; or the beach face, the portion of the shore extending from the low water line up to the limit of wave uprush at high tide. The CM Act defines the foreshore as 'the area of land between highest astronomical tide and the lowest astronomical tide'.

Gabion – steel wire mesh basket to hold stones or crushed rock to protect a bank or bottom from erosion; or structures composed of masses of rocks, rubble or masonry held tightly together usually by wire mesh to form blocks or walls. Sometimes used on heavy erosion areas to retard wave action or as a foundation for breakwaters or jetties.

Geodiversity – the natural range (diversity) of geological (bedrock), geomorphological (landform) and soil features, assemblages, systems and processes. Geodiversity includes evidence of the past life, ecosystems and environments in the history of the earth as well as a range of atmospheric, hydrological and biological processes currently acting on rocks, landforms and soils.

Geomorphology – that branch of physical geography which deals with the form of the earth, the general configuration of its surface, the distribution of the land, water, etc.; or the investigation of the history of geologic changes through the interpretation of topographic forms.

Geotechnical investigations – subsurface investigation of soils, rock, and other strata for the purposes of engineering design.

Geotextile – a synthetic fabric which may be woven or non–woven and used as a filter.

Global warming – the increase in the earth's temperature due to the emissions of greenhouse gases.

Groyne – a shore protection structure built (usually perpendicular to the shoreline) to trap littoral drift or retard erosion of the shore; or a narrow, roughly shore normal structure built to reduce longshore currents, and/or to trap and retain littoral material. Most groynes are of timber or rock and extend from a seawall, or the backshore, well onto the foreshore and rarely even further offshore.

Hard defences (protection) – general term applied to impermeable coastal defence (protection) structures of concrete, timber, steel, masonry, etc., which reflect a high proportion of incident wave energy.

Hazard – a process, or activity that affects an asset or value. See also 'coastal hazards' which are the specific hazards defined in the CM Act.

Highest astronomical tide (HAT) – the highest level which can be predicted to occur under average meteorological conditions and any combination of astronomical conditions. In Australia HAT is calculated as the highest level from tide predictions over the tidal datum epoch (TDE), this is currently set to 1992 to 2011.

The HAT and the Lowest Astronomical Tide (LAT) levels will not be reached every year. LAT and HAT are not the extreme water levels which can be reached, as storm surges may cause considerably higher and lower levels to occur.

Holocene – an epoch of the Quaternary period, from the end of the Pleistocene, about 8000 years ago, to the present time.

Hydrodynamic – relates to the specific scientific principles that deal with the motion of fluids and the forces acting on solid bodies immersed in fluids, and in motion relative to them.

Impacts – include damage, harm or losses to exposed communities, property, services, livelihoods, access, use and amenity, heritage, ecosystems and the environment because of exposure and sensitivity. Impacts may also be positive.

Incipient dune – the most seaward and immature dune of the dune system. Vegetation characterised by grasses such as spinifex. On an accreting coastline, the incipient dune will develop into a foredune.

Inshore zone – in beach terminology, the zone of variable width extending from the low water line through the breaker zone.

Interdecadal Pacific Oscillation (IPO) – an irregular interdecadal sea surface temperature in the Pacific Ocean that modulates the strength and frequency of the El Niño Southern Oscillation.

Intermittently closed and open lakes and lagoons (ICOLL) – coastal lakes and lagoons where the entrance may be closed to the sea from time to time and for varying periods, by accretion of a berm. ICOLLs have sensitive water quality because they accumulate loads of sediment and nutrients from the catchment and may have poor water circulation and flushing. The most sensitive waterways listed in the CM SEPP are all ICOLLs. The catchments of these lakes and lagoons are included in the coastal environment area.

Intertidal – that land area between mean low water and mean high water that is inundated periodically by tides.

King tides – any high water level that is well above the average, commonly applied to two spring tides that are the highest for the year, one during summer and one in winter.

La Niña – the opposite state to El Niño, occurring when the SOI is positive. La Niña tends to bring above average rainfall over much of Australia.

Lagoon – a shallow body of open water, partly or completely separated from the sea by a coastal barrier or reef. Sometimes connected to the sea via an inlet.

Likelihood – the chance of something happening, whether defined, measured or determined objectively or subjectively, qualitatively or quantitatively, and described using general terms or mathematically (such as a probability or a frequency over a given time period).

Littoral – of or pertaining to a shore, especially of the sea. Often used as a general term for the coastal zone influenced by wave action, or, more specifically, the shore zone between the high and low water marks.

Littoral rainforest – a closed forest ecological community recognised by its close proximity to the ocean (generally <2km) and closed canopy (i.e. ~70% of the sky obscured by tree leaves and limbs). Listed as an endangered ecological community under the NSW *Biodiversity Conservation Act 2016*. Littoral rainforest areas are mapped with coastal wetlands in the CM SEPP, to form the coastal wetlands and littoral rainforests management area. Development controls apply to the management area and a proximity area which is also mapped.

Littoral transport rate – rate of transport of sedimentary material parallel or perpendicular to the shore in the littoral zone. Usually expressed in cubic metres per year. Commonly synonymous with longshore transport rate.

Local council – for the purposes of the coastal management manual, a council that is wholly or partly within the coastal zone of NSW.

Longshore transport (littoral drift) – refers to the sediment moved along a coastline under the action of wave-induced longshore currents (Dean and Dalrymple, 2002). The net drift is the sum of the positive (conventionally northwards direction in NSW) and negative (southwards in NSW) direction. The gross drift is the sum of the drift magnitudes (absolute values). The differential drift is the difference between the net drift into and out of a coastal compartment. Both gross and net drift are typically averaged over a year and expressed in m3/yr.

Macro-invertebrates – large invertebrates which may be found in waterways and consisting largely of larval insects, worms, and related organisms.

Maintenance dredging – the recurrent dredging of sediment from a waterway, including existing navigation channels, approaches and berths, to allow safe navigation by commercial or recreational boating traffic.

Managed retreat – also referred to as managed realignment. For the coastal zone (generally the coastal vulnerability area), managed retreat allows the shoreline to migrate landward unimpeded. It allows an area that was not previously exposed to coastal processes and hazards to become exposed, for instance by removing or breaching coastal protection works. Managed retreat may involve the relocation landward, out of a coastal risk area, of homes and infrastructure under threat from coastal erosion, recession or inundation. It may also involve the deliberate setting back (moving landward) of the existing line of sea defence to obtain engineering or environmental advantages. During a managed retreat process, a new foreshore area or new intertidal habitat may be created.

Marine estate – the *Marine Estate Management Act 2014* defines it as:

(a) the coastal waters of the State within the meaning of Part 10 of the Interpretation Act 1987,

(b) estuaries (being any part of a river whose level is periodically or intermittently affected by coastal tides) up to the highest astronomical tide,

(c) lakes, lagoons and other partially enclosed bodies of water that are permanently, periodically or intermittently open to the sea,

(d) coastal wetlands (including saltmarsh, mangroves and seagrass),

(e) lands immediately adjacent to, or in the immediate proximity of, the coastal waters of the State that are subject to oceanic processes (including beaches, dunes, headlands and rock platforms),

(f) any other place or thing declared by the regulations to be the marine estate,

but does not include any place or thing declared by the regulations not to be the marine estate.

Marine sediment – sediment originating from the sea.

Mean high water mark – the line of the medium high tide between the highest tide each lunar month (the springs) and the lowest tide each lunar month (the neap) averaged over out over the year. In NSW, the methods for determining the position of the MHWM are outlined in the Crown Directions to Surveyors - No. 6 Water as a Boundary.

Mean sea level – the arithmetic mean of hourly heights of the sea at a tidal station, observed over a long period of time.

Multi-criteria analysis – a logical and structured decision-making tool for complex problems involving multiple factors or criteria, where a consensus is difficult to achieve. It may involve processes such as ranking, rating (with relative or ordinal scales) or pairwise comparisons. The process allows participants to consider, discuss and test complex trade-offs among alternatives

Natural character – includes all-natural aspects of the land and sea, including the underlying ecological, hydrological and geomorphological processes that shape landforms (including underwater features) and the natural movements of water and sediment. Natural character also includes aspects of the environment that affect human experience including the natural darkness of the night sky, the sounds and smell of the coast, and the context and setting of natural places.

Natural coastal processes – the coastal processes over which people have no control, such as wind, waves and tides.

Natural heritage – the natural living and non-living components, that is, the biodiversity and geodiversity, of the world that humans inherit.

Near shore – the area of ocean close to the coast that is affected by waves, tides and longshore currents.

No or low regrets actions – options which would be justified under any plausible future scenario (i.e. they are best practice in any circumstance), and similarly, actions which require only moderate investment to achieve a beneficial outcome.

NSW Coastal Council – established under Part 4 of the CM Act. A group of three to seven coastal experts, appointed by the Minister to provide advice on coastal management issues.

Outflanking or end effects – erosion behind or around the land-based end of a groyne, jetty or breakwater or the terminus of a revetment or seawall, usually causing failure of the structure or its function.

Overwash – the part of the wave uprush that runs over the crest of a berm or structure and does not flow directly back to the ocean or lake. When waves overtop a coastal protection structure they often carry sediment landwards which is then lost to the beach system. Also defines a process in which waves penetrate inland of the beach, which is common on low barriers.

Pollution – the condition caused by the presence of substances of such character and in such quantities that the quality of the environment is impaired; or the human-induced alteration of the chemical, physical, biological or radiological integrity of an aquatic ecosystem.

Probabilistic hazard assessment – a risk-based approach to managing coastal hazard that takes uncertainty into account by considering both the likelihood and consequence of hazard occurrence. It applies a stochastic simulation to evaluate coastal processes. The technique uses a distribution of values for each parameter to account for expected variation, or uncertainty, rather than single values. Parameters are then combined by a monte-carlo technique to produce a probabilistic forecast of future shoreline position. This is quite different to traditional deterministic hazard assessments that produce single values for beach erosion and shoreline recession.

Probabilistic model – mathematical model in which the behaviour of one or more of the variables is either completely or partially subject to probability laws.

Progradation – the building forward or outward toward the sea of a shoreline or coastline (as with a beach, delta, or fan) by nearshore deposition of river-borne sediments or by continuous accumulation of beach material thrown up by waves or moved by longshore drifting.

Public Authority – defined in the CM Act as a Minister of the Crown of the State, a State-owned corporation, an electricity supply authority, a department or instrumentality of the State, a local council and any other public or local authority constituted by or under any Act and includes any prescribed body.

Recession – a continuing landward movement of the shoreline; or a net landward movement of the shoreline over a specified time.

Reflection – the process by which the energy of the wave is returned seaward.

Refraction – the process by which the direction of a wave moving in shallow water at an angle to the contours is changed. The part of the wave advancing in shallower water moves more slowly than that part still advancing in deeper water, causing the wave crest to bend toward alignment with the underwater contours; or the bending of wave crests by currents.

Residual risk – the risk which remains after managing and reducing risks. It may include for example, risks due to very severe storms or from unexpected hazards.

Resilience – the ability of a system (human or natural) to adapt to changing conditions (including hazards or threats, variability and extremes), and rapidly recover from disruption due to emergencies. Resilient systems or communities have the capacity to ‘bounce back’ after a disrupting event such as a major storm or an extended heat wave, to moderate potential damages, take advantage of opportunities, maintain or restore function or to cope with the consequences.

Revetment or seawall – a type of coastal protection work which protects assets from coastal erosion by armouring the shore with erosion–resistant material. Large rocks/boulders, concrete or other hard materials are used, depending on the specific design requirements.

Rip – a narrow, strong shore normal current in the nearshore area of most wave-dominated beaches (i.e. most beaches along the open coast of NSW). They are fed by along shore

feeder currents initiated by the deflection of waves at the shoreline. There are diverse types of rip on NSW beaches and they affect beach safety.

Riparian – pertaining to the banks of a body of water, such as an estuary.

Risk – effect of uncertainty on planning and management objectives, usually characterised by reference to potential hazards, their consequence and their likelihood. Consequence combines the concepts of magnitude, sensitivity and duration.

Sand drift – the movement of sand by wind. On the coast, this generally describes sand movement resulting from natural or human-induced degradation of dune vegetation, resulting in either nuisance or major sand drift (dune transgression).

Sea level rise – an increase in the mean level of the oceans. Relative sea level occurs where there is a local increase in the level of the ocean relative to the land, which might be caused by ocean rising, the land subsiding, or both. In areas with rapid land level uplift (e.g. seismically active areas), relative sea level can fall.

Sediment cells (tertiary) – small and relatively contained sediment compartments. A tertiary sediment cell may apply to a single beach/embayment.

Sediment transport – the process whereby sediment is moved offshore, onshore or along shore by wave, current or wind action.

Sensitivity – the degree to which a built, natural or human system is directly or indirectly affected by changes in hazards, threats or climate conditions.

Shoreline recession – refers to continuing landward movement of the shoreline, that is, a net landward movement of the shoreline, generally assessed over a period of several years. As shoreline recession occurs the beach fluctuation zone is translated landward.

Southern Oscillation Index – the normalised mean atmospheric pressure difference between Tahiti and Darwin, measured at sea level. The SOI is negative during El Niño and positive during La Niña.

Stakeholder – a person or organisation with an interest or concern in something.

State objectives – the state's objectives for the coast are set out in the CM Act.

Storm surge – the increase in coastal water level caused by the effects of storms. Storm surge consists of two components – the increase in water level caused by the reduction in barometric pressure and the increase in water level caused by the action of wind blowing over the sea surface (wind set-up).

Storm tide – an abnormally high water level that occurs when a storm surge combines with a high astronomical tide. The storm tide must be accurately predicted to determine the extent of coastal inundation.

Strategic management of the coast – planning and management that is wide-ranging, considers multiple issues at multiple spatial scales and multiple timeframes. It identifies the opportunities and constraints of different broad options to achieve big-picture objectives and defines the best way forward.

Surf zone – defined in CM Act as the area from the line of the outer most breaking waves to the limit of wave run-up on the beach.

Sustainable management – develops and implements proposals that meet the needs of present communities without compromising the ability of future generations to meet their own needs.

Swash zone – the zone of wave action on the beach, which moves as water levels vary, extending from the limit of run down to the limit of run-up.

Swell waves – ocean waves that travel beyond the area where they are generated.

Threats – see Coastal threats. In the coastal management context, a threat is a process or activity which puts pressure on one or more coastal assets or values. Threats may include land uses (e.g. urban, recreation), land management, climate change, industrial discharges, stormwater runoff, overfishing, invasive species as well as the pressures from coastal hazards.

Threshold – can be identified for aspects of coastal systems, to highlight tipping points for irreversible change.

An ecological threshold is the point at which there is an abrupt change in the structure, quality, or functioning of an ecosystem or where external changes produce large and persistent responses in an ecosystem. A species threshold may disrupt aspects of the species population, productivity, reproduction, or habitat in response to a stressor. Such 'tipping points' can lead to unwanted changes in ecosystems and may slow the recovery of ecosystems or limit their ability to achieve more resilient states following a disturbance.

Similarly, a social or economic threshold of change in a coastal community indicates the point at which the structure, function, social connectedness, equality or economic activity of the community changes beyond recovery.

Thresholds can also be defined for coastal water levels as they relate to the resilience of certain types of development.

Tidal channel – a major channel followed by tidal currents, extending from offshore into a tidal marsh or a tidal flat; tidal inlet.

Tidal circulation – the movement of fresh water and seawater that are mixed by currents and flows in an estuary, in response to ocean tides.

Tidal delta – where an inlet of a barrier estuary or open coastal lake is dominated by tidal processes, a flood tide delta develops inside the entrance, as tidal currents transport marine sand into the estuary. Ebb tide deltas may also occur, outside the mouth of an estuary.

Tidal flushing – the removal of water and sediment from an estuary, by the ebb and flow of tidal currents that are stronger, more constant, or more prevalent than the incoming river flow.

Tidal inundation – the inundation of land by tidal action under average meteorological conditions and the incursion of sea water onto low lying land that is not normally inundated, during a high sea level event such as a king tide or due to longer-term sea level rise.

Tidal limit – the maximum upstream location on a watercourse at which a tidal variation in water level is observed.

Tidal prism – the total amount of water that flows into a harbour, estuary or lake or out again with movement of the tide, excluding any freshwater flow.

Tolerable risk – a risk that, following an understanding of the likelihood and consequences, is low enough to allow the exposure to continue, and at the same time high enough to require new treatments or actions to reduce risk. Society can live with this risk but believe that as much as is reasonably practical should be done to reduce the risks further. Note that individuals may find this risk unacceptable and choose to take their own steps, within reason, to make this risk acceptable. Residual risks are considered tolerable only if risk reduction is impractical.

Training walls – walls constructed at the entrances of estuaries and rivers to improve navigability.

Trigger – pre-negotiated decision-making points and commitments, so that action on coastal risks is taken when necessary, and when it is most convenient and affordable for the affected community

Tropical cyclone – intense low-pressure system in which winds of at least 63km/hour whirl in a clockwise direction, in the southern hemisphere around a region of calm air.

Tsunami – a long period water wave caused by an underwater disturbance such as a volcanic eruption or earthquake. Sometimes (incorrectly) called a 'tidal wave'.

Unacceptable risk – a risk that, following an understanding of the likelihood and consequences, is so high that it requires actions to avoid or reduce the risk. Individuals and society will not accept this risk and measures should be put in place to reduce risks to at least a tolerable level.

Vulnerability – a function of exposure and sensitivity of assets to a hazard, which determines the potential impacts of the hazard. For instance, the vulnerability of coastal assets may be influenced by the extent and impact of environmental, social and economic factors such as saline contamination of soils from flooding, erosion of built-up and natural areas, loss of vegetation, disruption to use, or access, or continuity of service, or loss of amenity, corrosion of built structures, undermining of foundations or damage to contents. Vulnerability also considers the adaptive capacity which is the capacity to adapt or the resilience in the system to manage the impacts and changes.

Wave amplitude – the magnitude of the displacement of a wave from a mean value. An ocean wave has an amplitude equal to the vertical distance from the still water level to wave crest. For a sinusoidal wave, amplitude is one–half the wave height. (USACE).

Wave climate – the seasonal and annual distribution of wave height, period and direction.

Wave-dominated coast – the coast of south eastern Australia is a wave-dominated system. This affects the beach type and the types of estuaries that occur in the landscape.

Wave energy – the capacity of waves to do work. The energy of a wave system is theoretically proportional to the square of the wave height; a high–energy coast is characterised by breaker heights greater than 50 centimetres and a low–energy coast is characterised by breaker heights less than 10 centimetres. Most of the wave energy along equilibrium beaches is used in shoaling and in sand movement. The NSW coast is a high wave energy coast.

Wave run-up – the vertical distance above mean water level reached by the uprush of water from waves across a beach or up a structure.

Wave set-up – the rise in the water level above the still water level when a wave reaches the coast. It can be very important during storm events as it results in further increases in water level above the tide and surge levels.

Wind waves – ocean waves resulting from the action of the wind on the surface of the water.

Zone of profile fluctuation – the area within which the subaerial beach profile can be expected to fluctuate under the current patterns of climate and weather conditions (i.e. including storms and decadal scale cycles).

Zone of slope adjustment – the area landward of an escarpment cut by storm bite, which may be affected by slumping to the angle of repose of the sand as it dries.

Abbreviations

CM Act	*Coastal Management Act 2016*
CM SEPP	State Environmental Planning Policy (Coastal Management) 2018
CMP	Coastal Management Program
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CZMP	Coastal Zone Management Plan (a plan prepared under the former *Coastal Protection Act 1979*)
DPE	NSW Department of Planning and Environment
GIS	Geographical Information System
IAP2	International Association of Public Participation
IP&R	Integrated Planning and Reporting (in accordance with the *Local Government Act 1993*)
ISO	International Organisation for Standardization
LGA	Local Government Area
OEH	NSW Office of Environment and Heritage
SEPP	State Environmental Planning Policy